REPORT ON THE AGE AND MINERAL CHARACTERISTICS OF THE GRANITES OF TASMANIA

Granites of two ages occur in Tasmania, viz. those which were intrusive at the end of the Cambro-Ordovician and the Silurian Periods respectively. The former is generally referred to as belonging to the Porphyroid suite of igneous rocks and the latter to the Devonian Period. The Devonian granites have a much greater areal extent and are much more important economically than the Porphyroid granites and associated types. The two suites have different characteristics and will be described separately.

In addition to specific references given in the following descriptions, the general references to the granites, etc. include:-

1. Twelvetrees & Petterd, Trans. Aust. Inst. Min. Engrs. Vol. V, p. 98, 1898.
2. Twelvetrees, Proc. A.A.A.S., 1902, p. 264.
3. " " " 1904, p. 210.
4. Ward " " 1911, pp. 148 and 165.
5. Hills, Roy. Soc. Tas., 1921, p. 111.
6. " Proc. A.I.M.M., No. 52, p. 129.

PORPHYROID GRANITES

The Porphyroid granites are restricted to the western, north-western and north central divisions of the State. Their areal extent is small, but they are closely associated with other igneous rocks of the same suite which occupy a greater area. The associated rocks are acid, intermediate and basic in composition and include plutonic (syenites), hypabyssal (porphyries, porphyrites, etc.) and volcanic (keratophyres, felsites, spilites, etc.) types as well as pyroclastic representatives.

The areas occupied by these associated rocks are shown on the attached map as well as the granites.

The granites apparently represent the closing stages of the above series of intrusions as they are found intrusive into the volcanic members of the series at South Darwin and Dove River. At Mount Farrell they pass gradually into the volcanic members.

The evidence for the age determination of these rocks includes the following:-

1. They are interbedded with and also intrusive into the rocks of the Cambro-Ordovician system, especially those portions associated with and overlying the Dundas series. They are thus apparently of the same age as the upper portion of the Cambro-Ordovician system.

2. They are overlain by the basal series (West Coast Range Conglomerate series) of the Silurian system, and these conglomerates contain pebbles of the porphyroid rock types (Bull. No. 16). They are thus pre-basal Silurian.

3. The rocks have been subjected to stresses which have resulted in strain and mineral reconstitution. Such features do not occur in the igneous rocks of Devonian age and so the Porphyroid suite are regarded as older than the Devonian.

The granites are known from a few localities only, viz. Mt. Farrell, Dove River (and Bond Peak), South Darwin and Low Rocky Point.

Mt. Farrell. - (See Bull. No. 3, p. 10). The igneous rocks include granite, syenite, porphyry and felsites and fragmental types. The greater part of the plutonic rocks is a syenite which merges by insensible gradations into a porphyritic felsite. The rock consisted of orthoclase, plagioclase, hornblende, biotite, apatite, with quartz present in some specimens. The rock has been altered by dynamic stresses and reconstitution has occurred. The felspars have been altered, and the hornblende and biotite altered to chlorite and epidote. All minerals show strain effects producing fracturing and wavy extinctions.

The quartz is intergrown with the orthoclase. At some places the amount of quartz increases and the rock becomes a granite.

The above rocks are interbedded with and intrusive into the Cambro-Ordovician slate series of the district, and are regarded as older than the Devonian granite in the adjacent Granite Tor district.

Dove River (and Bond Peak) - (See Bull. No. 14, p. 23 and Bull. No. 29, p. 31). The Porphyroid rocks of this district include granites and granite porphyry as well as porphyries and porphyrites representing altered volcanic eruptive of acid and sub-acid composition. Pyroclastic members are also present.

The granite is a granular reddish rock consiting of pink orthoclase, quartz and green chloritic pseudomorphs (after biotite and perhaps hornblende). Micropegmatitic or graphic structure is present.

The granite porphyry consists of porphyritic crystals of biotite, turbid felspar and quartz in a holocrystalline groundmass of quartz and felspar.

South Darwin - (See Bull. 16, p. 32). The Porphyroid rocks of this district include granite, quartz porphyry, granophyre, felsite keratophyre, felsite and pyroclastic types.

Practically all types have been affected by dynamic stresses.

The granite in this district occupies a larger area than in the above two districts and occurs as a belt 3 miles by half a mile, with a smaller area to the south.

The granite is a coarse holocry-stalline type, consisting of quartz, orthoclase, plagioclase and biotite. Orthoclase pre-dominates over plagio-clase which has been largely altered to kaoline and chlorite. The quartz shows marked wavy extinction.

The granite intrudes the felsites with a

sharp contact.

Low Rocky Point District. - The granitic rocks in this district range from extremely coarse-grained to medium-grained types of granite and to quartz-felspar porphyries. They occur in the form of long dykes intrusive into the Cambro-Ordovician and Porphyroid series. They consist of quartz, felspar and biotite, the felspars being predominantly orthoclase. Small irregular masses of chlorite occur in the coarse types and apparently represent inclusions of the chlorite schists which occur in the rocks in which the granite is intrusive.

DEVONIAN GRANITES

Granites of Devonian age occur generally throughout Tasmania, but are more particularly restricted to the north-western, north-eastern, eastern and south-western parts. It is probable also that granites underlie the central and south-eastern parts of the State, but are covered by the younger Permo-Carboniferous and Triassic rocks of these regions.

The largest and most continuous areas are in the north-eastern and eastern districts, and there is a little doubt that these represent the outcropping portions of a batholith. The tin deposits of these regions are associated with this batholith.

The areas in the north-western districts are smaller and more detached. Ward (A.A.A.S. Vol. XIII, 1911) regarded these separate massifs as outcropping portions of a larger underground body. Such a body would represent a batholith of similar proportions to that in the north-eastern districts.

The occurrences in the south-western districts are small and islolated.

Although the granites form the greater part of the Devonian igneous intrusions, a number of other interesting rocks occur. These include numerous types of ultrabasic rocks (peridotites, pyroxenites, serpentines, etc.), basic rocks (gabbros and norites) and intermediate rocks (syenites). The ultra-basic and basic rocks were the first to be intruded and the granites the last.

The determination of the Devonian age of the granites and associated rocks depends upon the following evidence.

1. They are intrusive into all rock formations up to and including the Silurian system. They are therefore post-Silurian.

2. They are overlain by the basal beds of the Permo-Carboniferous system and are therefore pre-Permo-Carboniferous.

3. The old land surface of Proterozoic and Lower Palaeozoic rocks has been eroded to sufficient depths to expose the granites and the whole was peneplained before the basal Permo-Carboniferous beds were laid down. The intrusions thus occurred a considerable time before the Permo-Carboniferous sedimentation.

North Eastern Districts - (See Bull. Nos. 9, 25, 38 and 40). The normal type is a porphyritic granite with large phenocrysts of felspar (up to 3 inches in length), the remainder of the rock being composed of quartz, felspar (orthoclase and plagioclase) and biotite. The phenocrysts are stated to be both orthoclase and soda-orthoclase and oligoclase. Plagioclase is also stated to be present. In many localities the porphyritic tendency is not so pronounced.

The normal rock is generally a black and white type and identical with the Victorian granodiorites and from magascopic examinations I have always regarded it as a grano-diorite. (Pink varieties are quite subordinate). Judging by the following analysis (Bull. 38, p. 18) the rock type approaches an adamellite:-

SiO_2	-	69.44
FeO	-	1.16
Fe_2O_3	-	3.29
Al_2O_3	-	15.22
TiO_2	-	0.40
CaO	-	3.00
MgO	-	1.59
Na_2O	-	2.59
K_2O	-	4.11
I.L.	-	0.30
		101.10

In the vicinity of the tin deposits the granite is usually a finer and more even grained type in which muscovite appears in addition to the quartz, felspar and biotite. The rock is often altered by mineralising agencies and much of the muscovite has been formed through a series of changes of the biotite.

Smaller quantities of more basic types occur at numerous localities. In the Scamander district (Bull. 9) several types occur. They are generally porphyritic but more even-grained types also occur. The phenocrysts are plagioclase (oligoclase-andesine), quartz, hypersthene, biotite and orthoclase (sparsely distributed). The ground mass consists of quartz and felspar. Hornblende also occurs and sometimes to the exclusion of hypersthene.

At Lisle and Golconda (Bull. 4 and 37) the rock is non-porphyritic and finer than the usual granite. It consists of biotite, hornblende, quartz, lime-soda felspars and a little orthoclase. The following analyses of hard biotite granite prove it to approach an adamellite:-

		Reg. No. 710	Reg. No. 621
SiO_2	-	61.60	65.80
FeO	-	2.97	-
Fe_2O_3	-	7.00	6.29
Al_2O_3	-	14.71	17.91
CaO	-	4.80	4.00
MgO	-	2.68	1.66
Na_2O	-	4.05	2.65
F_2O	-	1.72	2.59
TiO_2	-	0.20	0.20

In addition to the above main types, there are, in close proximity to the tin deposits, numerous other types all more or less connected with such deposits. These include pegmatite, aplite, greisen and greisenised granites, etc. (see Bull. Nos. 38 and 40).

Heemskirk District - (See Bull. No. 21). The granitic rocks include granite, granite porphyry, aplite and pegmatite.

The normal type of granite is a pink one of medium-grain size with a tendency to be porphyritic in places.

The essential minerals present are orthoclase, quartz, plagioclase, biotite, tourmaline with accessory apatite, zircon and magnetite.

The "tin" granite of this district is a white type with abundance of quartz tourmaline veins and nodules. It consists essentially of plagioclase, quartz, orthoclase, tourmaline (green, brown and blue) and a little biotite, muscovite and apatite.

Meredith Range and Stanley River - (See Bull. Nos. 15 and 32). The rocks here are generally similar to those at Heemskirk. The granite is light coloured, even and medium in grain, with a tendency to become porphyritic.

The minerals in order of relative abundance are orthoclase, plagioclase, quartz and biotite, with tourmaline sometimes present. When present the phenocrysts are white orthoclase. Quartz tourmaline nodules and veins of tourmaline are present in some localities.

Belfour District - (See Bull. No. 10). The granite is medium grained with a porphyritic texture developed at some places. The phenocrysts are simply twinned orthoclase. Both orthoclase and plagioclase (oligoclase to albite) are present. Quartz, biotite, muscovite, tourmaline and apatite are also present, the tourmaline being plentiful in those varieties with abundant muscovite.

Moina District - (See Bull. Nos. 14 and 29) The granite is a pink, even and medium grained variety. It is composed of felspar (orthoclase and oligoclase-andesine) quartz and biotite.

Other Localitites - Descriptions of the granites at the other localities in the north-western districts are not so complete and detailed. The rock types are, however, generally similar to those already described.

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